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ORIGINAL ARTICLES.

ON THE HISTOLOGY OF A CASE OF SUDDEN BLINDNESS CAUSED BY AN INJURY TO THE SKULL. THE FIRST CASE OF FRESH CHOROIDAL RUPTURE HISTOLOGICALLY EXAMINED.[1]

BY ADOLF ALT, M.D., ST. LOUIS, MO.

THE case which I wish shortly to report here may, perhaps, not be unique. Clinically I know it is not. Yet, if any similar case has been microscopically examined and described, I have failed to be able to find it in the literature at my disposal, nor have I in my somewhat extended researches in the field of the histo-pathology of the eye ever met with such histological changes.

The specimen came into my hands without my having seen the case previously. For it and the following clinical history I am indebted to my friend, Dr. Joseph Spiegelhalter, of St. Louis, Mo., who had removed the eyeball. He writes as follows:

[1]Read before the Ophthalmic Section of the British Medical Association, held at Montreal, August–September, 1897, and republished with Original Photographs.

"E. B., a lad, aged 18 years, while playing with a revolver in the evening of March 23, 1897, accidentally shot himself in the head. The entrance wound of the bullet was situated in the temporal surface of the frontal bone on the left side, three-quarters of an inch above the zygomatic process and one inch behind the linea semicircularis. The wound canal passed directly forward and a little downward. In its passage the bullet had slightly injured the roof of the orbit, at least on its cerebral surface, and lacerated to some extent the base of the left anterior lobe of the brain.

"I saw the lad about an hour after the accident, when I found him in the hands of two practitioners who had been examining and probing the wound canal, and had removed some brain substance mixed with several small spicules of bone. There had hardly been any hæmorrhage from the wound. The left eyelids were swollen and the eyeball protruding. The patient was in a semi-comatose condition, from which by loud calling he could be aroused sufficiently to answer some simple questions. There was only doubtful perception of light in the eye on the injured side, and touching the eyeball produced no reflex action. The pain caused by the injury seemed to be comparatively trifling.

"I cleaned the wound canal thoroughly, removed what I could find of loose brain substance and bone tissue, and dressed it antiseptically.

"The night following the injury the patient slept fairly well. His pulse and temperature remained normal.

"The next day it was clear that the visual function of the protruding eye was absolutely destroyed. The exophthalmos increased more and more. On March 26, that is, not quite three days after the injury had occurred, the cornea, not being covered by the eyelids, showed signs of decay. I therefore proceeded to remove the eyeball, together with some adherent orbital tissue, Tenon's space having been totally obliterated.

"After the removal of the eyeball I again made a thorough digital examination of the walls and roof of the orbit in order to see whether or not the bullet had perforated the orbit. I could, however, find no opening anywhere.

"I am, therefore, of opinion that the bullet had passed along the cerebral surface of the roof of the orbit, shattering it to some extent, and had entered the frontal sinus near the

crista. It is, no doubt, at present lodged in the sinus frontalis, and causes no apparent inconvenience."

When Dr. Spiegelhalter had reported this case to the Association of German Physicians of St. Louis, Mo., a discussion took place as to the direct cause of the sudden blindness from the brain injury, and as a consequence the specimen preserved in formol solution was given to me for microscopical examination.

I found the eyeball surrounded by a considerable amount of muscular and orbital tissue firmly matted together. Attached to it remained a piece of optic nerve almost one inch in length.

I divided the eye by an equatorial seetion into an anterior and a posterior half. When the sclerotic was opened a considerable amount of sanguineous fluid came from the vitreous chamber. The remaining vitreous body was adherent to the lower part of the retina. Where this attachment had taken place a fold of retinal tissue was raised to some extent into the vitreous chamber. The fold reached from the optic papilla to the very ora serrata.

When, before embedding, I removed the specimen from the formol solution to the alcohol all the tissues of the eyeball and the surrounding orbital tissue took on a more or less bright red blood color. This, of course, showed that extensive hæmorrhage had taken place into the orbit, penetrating into all the tissues of the eyeball and into the inter-vaginal space of the optic nerve. This was macroscopicall visible and so extensive must the hæmorrhage have been, that it alone would have sufficed to explain both the exophthalmos and the sudden blindness, had there been no other pathological changes within the eye.

The optic nerve had evidently not been severed by the bullet, nor do I think that, from the description of Dr. Spiegelhalter, the bullet took a course in which it met with this nerve.

No ophthalmoscopic examination having been made, the clinical features, pointing in themselves to an enormous hæmorrhage into the orbital tissue, were sufficient to explain both blindness and exophthalmos. Whether the blindness was absolute and would have been lasting, or whether the subsequent absorption of the extravasation would have led to a partial return of vision it is impossible to say.

In general, all the tissues when microscopically examined were filled with red and white blood cells.

I found the most interesting changes in the choroid and retina, and especially at the place where the raised fold of retinal tissue protruded into the vitreous chamber.

As a result of the *contre-coup* these tissues show a large number of ruptures differing as to their extent in surface as well as depth. It is particularly to these ruptures that I want to draw your attention, and more especially to the one which seems to be the type of what has clinically been termed an isolated choroidal rupture, although, as far as I know, it has never yet been examined microscopically. The other and manifold changes in the structure of the retina and choroid, which are remarkable since only such a short time (barely three days) had elapsed between the occurrence of the injury and the enucleation of the eyeball, I do not wish to describe here.

The simplest form of rupture of the choroid which I found produced by the injury, was a tear through the lamina vitrea and pigment epithelium. This was followed, or perhaps preceded, by a hæmorrhage which lifts up a small fold of retina. The blood is mixed with a large number of cells containing pigment and free pigment granules, evidently derived from the cells of the pigment epithelium in the neighborhood of the rupture. The retina, excepting its bacillary layer, is comparatively unaltered.

The larger the tear, and the more the blood extravasated under the retina, the greater is the alteration by the pressure in the structure of the retina, until, in some places, this can hardly be recognized as such. In spite of such considerable alteration in structure the retinal blood vessels may remain apparently unaltered, at least they are so in a number of places in this case. They are, in some of these, very hyperæmic, especially the veins, in others they are empty; and sometimes they show signs of a beginning endovasculitis.

In some parts two or three such small ruptures of the inner surface of the choroid are situated close beside each other. Near one there seem to be evidences of a new formation of blood vessels, which grow from the choroid into the extravasated blood, by which the retina is pressed inward toward the vitreous. (See Figs. 1 and 2).

In one place a rupture has taken place through the whole thickness of the choroid. The gap resulting in this manner is

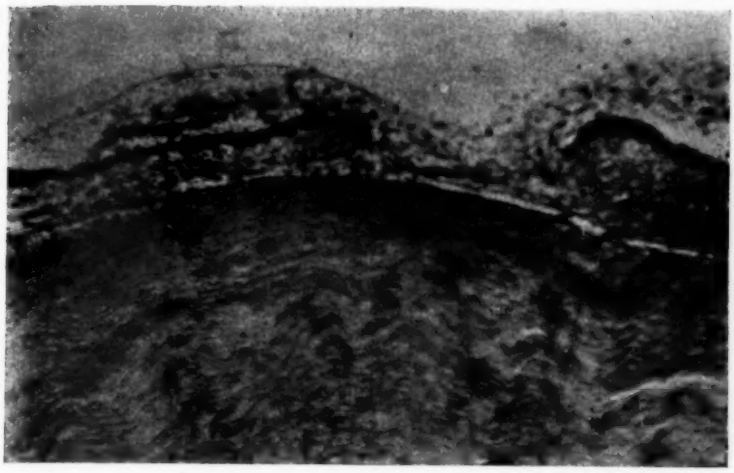

FIG. 1.

FIG. 2.

filled and covered over by retinal tissue. At the edge of this

tear the retraction of the choroidal wound lips is plainly shown by the wavy line formed by the relaxed lamina vitrea. The pigment epithelium seems to be proliferating, and new and unpigmented cells are situated in the folds of the lamina vitrea. The retinal tissue covering the gap has lost all its characteristic features. It appears as a loose, more or less laminated connective tissue, in which are embedded a number of round cells, perhaps remnants of the retinal cells, and cells carrying pigment derived either from the choroidal cells or from those of the pigment epithelium layer. (See Fig 3).

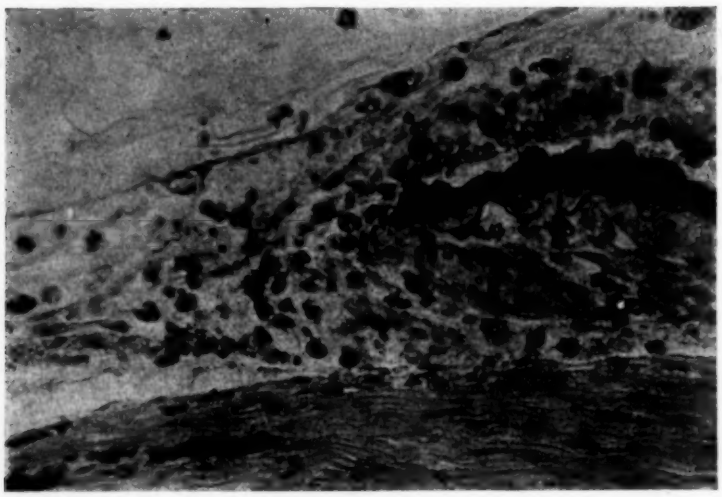

FIG. 3.

This, I think, is the histological appearance of that condition which has clinically been termed an isolated rupture of the choroid.

Farther forward towards, and exteding into, the ora serrata there is a very large gap in the whole thickness of the choroid. Here the sudden gush of blood from the torn choroidal blood vessels has torn loose a large flap of the retina and folded it backwards upon itself. The vitreous has filled the gap in the choroid and has assumed a markedly fibrillar structure. The detached retina is greatly broken up in its outer layers, although its blood vessels are still well filled with blood, at least here and there.

All the ruptures which I have thus far mentioned concerned chiefly and primarily the choroid, and seem to have affected the retina secondarily only. There are, however, also a number of places in which the *contre-coup* has caused a rupture of the retina alone, and in which the choroid has remained perfectly intact. These ruptures, as far as I have observed them, seem to have penetrated the whole thickness of the retina. The wound lips of this membrane are retracted, and the retinal elements in the neighborhood of the rupture are considerably altered by degenerative changes. The gap, resulting from the retraction of the wound lips, is filled with a small

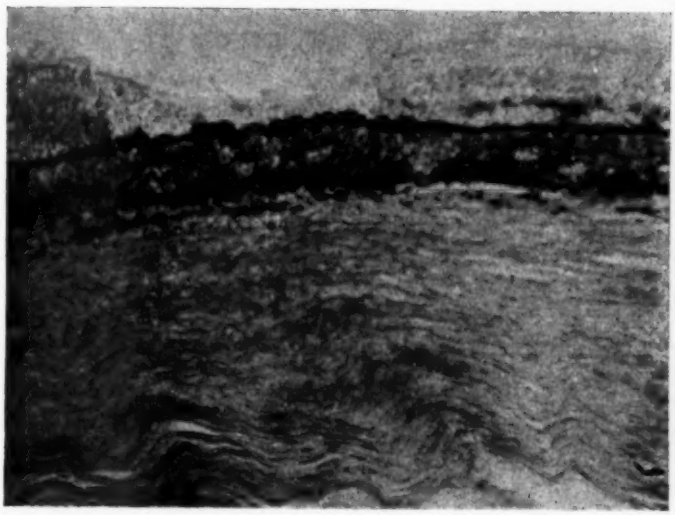

FIG. 4.

amount of very loose fibrillar tissue of doubtful origin, embedded in which is a number of cells. Some of these are unpigmented round cells, and seem to be, perhaps, remnants of the retinal cells; others are filled with pigment granules, and are probably derived from the pigmented epithelial cells. Whether this interposed tissue is derived from the adjacent vitreous body, or from the retina, from both these sources, it is impossible to tell. (See Fig. 4).

I have brought a photograph here, which is taken from another eye, which was destroyed by a bullet which struck the

cornea obliquely. Besides other changes not concerning us just now, the *contre-coup* here led to a large rupture in the choroid, causing an immense hæmorrhage. The retina in turn was altered in a peculiar manner by this hæmorrhage, as, besides being detached *in toto*, its outer layers (in some parts the bacillary layer, in others the bacillary and outer granular layers together) were torn loose from the remainder of this membrane. It would take too long to detail to you here the changes which have taken place in other membranes of the interesting eyeball which is the subject of this report.

Since this paper was written, the last number of *v. Graefe's Archives* (XLIV., 1) has reached me, containing an article by S. Ginsberg on the microscopical conditions found in an eye which had undergone an isolated choroidal rupture eleven years prior to its enucleation. This rupture, having so long been cicatrized, presents totally different features from the case of recent rupture I have just reported. Ginsberg has, however, also carefully gone over the literature of the subject, and, like myself, he could not find a single case of recent choroidal rupture which had been microscopically examined and placed on record.

With this testimony added I suppose that the case I have reported to you is really the first case of a recent choroidal rupture which has been microscopically examined.

THE TECHNIQUE OF NEEDLE OPERATIONS UPON THE LENS AND UPON THE CAPSULE.[1]

BY EDWARD JACKSON, A.M., M.D., PHILADELPHIA, PA.,

PROFESSOR OF DISEASES OF THE EYE IN THE PHILADELPHIA POLYCLINIC,—SURGEON TO WILLS EYE HOSPITAL.

CERTAIN points with reference to needle operations upon the crystalline lens, and upon the capsule after the removal of the lens, are not sufficiently discussed in the recent text-books or elsewhere in ophthalmic literature.

The first point is that it is sometimes very important to clearly differentiate the operation of discission to produce absorption of the crystalline lens from the division of a membrane remaining after the lens has been removed. This distinction is of especial importance when the discission is done to ripen an immature cataract or to prepare the clear lens for removal in high myopia.

After discission the liability to pericorneal redness, photophobia and pain is directly increased in proportion to the amount of unaltered or slightly altered lens substance lying free in the anterior chamber. At least, this is true of the majority of cases.

The object to be aimed at in these operations is, therefore, the greatest breaking up of the lens with the least escape of lens substance into the anterior chamber. This is to be attained by making the incision in the capsule small, whlle allowing free movement of the blade within the lens substance. This is only possible when we can bring the opening in the capsule close to the opening in the cornea. The corneal wound must be in front of the pupil, and the aqueous humor

[1] Read before the Section of Ophthalmology of the College of Physicians of Philadelphia, November, 1897.

must be allowed to escape through it before proceeding to stir up the lens substance.

In contrast with the above is the need for overcoming the elasticity of the membrane and making as large an incision as possible in the division of the thickened capsule after lens extraction. The object here is accomplished by placing the corneal wound which serves as a fulcrum, as far from the incision in the capsule as possible, and preserving the distance between them by retaining all the aqueous humor throughout the operation by using a needle with a shank large enough to fill the corneal incision.

A second point is that where there is to be much sweeping of the knife-needle, as for the division of a tough membrane it is best to make the incision not through the clear cornea as commonly taught, but through the overlapping vascular tissue of the limbus. By doing this we lessen the danger of infection as well as get a greater sweep of the blade. We know that injured corneal tissue is replaced by sound tissue rather slowly, so that considerable time may elapse after a needle operation before the eye is safe from infection if the tissue about the corneal incision has been bruised in the operation. If, however, the knife is entered through the overlapping conjunctiva and sclera of the limbus the wound will be certainly sealed from external infection within a few hours, and the risks which have caused a needle operation to be regarded as more dangerous than a lens extraction will be almost entirely avoided.

The plan of entering the needle thus peripherally I have employed, wherever practicable, for more than ten years, and have never seen serious disturbance of the eye follow it. Its weak point is, that the needle lying nearly in the plane of the membrane to be divided, it is more difficult to make the division of the membrane exactly at a given point. A slight deviation of the blade makes a considerable difference in the location of the incision. This, however, is a minor consideration when weighed against safety and the ability to divide more certainly and freely tough and elastic membranes that a peripheral entrance gives.

A third point is that in dividing capsular remains after cataract extraction we should, as far as possible, plan our incisions so as to cut through the bases of any posterior synechia

that may be present. Usually it would complicate the operation and might defeat its purpose of giving a clear pupil to attempt exactly to divide each synechia. But it often answers the same purpose, of freeing the iris from irritating drag upon it, if you make the incision pass close to the base of the synechia and divide the membrane across the direction of tension. In this locality, also, the membrane is usually easier to divide, less apt to give before the cutting edge. I have repeatedly seen eyes that remained irritable for many weeks with isolated synechia upon which the iris dragged become perfectly quiet immediately after the freeing of such synechia by division of the capsule close to it.

A fourth point is that in dividing a thickened capsule unless the pupil be quite large it is not best to attempt a crucial incision. After the first incision has been made the membrane becomes so relaxed that it is impossible to cut *from* the original incision. The needle must then be entered at the margin of the pupil and made to cut *toward* that incision. For a crucial incision this necessitates the introduction of the needle on both sides. One is more likely to be successful in making a T-shaped incision.

One plan is to make an incisiom in the margin of the pupil towards the point of corneal entrance by the first sweep of the knife and then to penetrate the membrane at the farther margin of the pupil, and by a second sweep to cut towards the first incision. Another plan is to make the T-shaped incision with both of its lines oblique to the direction of the knife. A successful T-shaped incision will give sufficient gaping in any membrane upon which it is proper to attempt a single needle operation.

A CONTRIBUTION TO THE GLAUCOMA QUESTION.

BY N. J. WEILL, M.D.,

FROM THE EYE CLINIC OF THE UNIVERSITY OF ZUERICH, SWITZERLAND.

WITH this publication I simply desire to offer a few notes or rather an imperfect analysis on a very important subject with which we are daily brought into the most intimate relation, while as yet we are in a most unsatisfactory position to favorably combat it. At a first, yes, perhaps after a repeated consideration of this article, it is quite probable that many will discard these remarks, as they are scarcely consistent with former teachings and are perhaps really impossible. In some respects I am in perfect accord with these men of experience, yet do not most curious disclosures sometimes rapidly alter our opinions? Theories, which our ancestors regarded as unconvincing and absolutely impossible, we now readily accept and look upon as expressly adapted for this or that which occurs to-day. The same may be the fate of the following hypothesis, if those, who are in a position to prove its correctness, fail to respond.

If I had been able to find, by experiment, the needed support to my theory, this particular manuscript should have been given to the publishers some five months ago. According to Mauthner, it is but a loss of time to attempt to set up glaucoma in the eyes of animals, nevertheless in the past eleven months I have endeavored, in various ways, to arouse glaucoma in the rabbits' eye (hypermetropic), but to this day I have been unsuccessful; among others I tried was the method of Knies, but with absolutely negative results.

Thus the following remarks, being solely theoretical, would have been withheld for some time yet; but as Abadie, in the *Ophthalmologische Klinik*, No. 1, has most recently published an article, concerning the course and action of the sympathetic fibers in glaucoma, they may not be too untimely.

It would not be perfectly just to claim that all portions of this theory are true, but I do not hesitate to prophesy, that its consequent operation will eventually fill a long needed want in ophthalmology. That its application will be met by innumerable corrections is foreseen, but is unavoidable.

Before writing this article the works of Adamük, Wegner, v. Hippel, Grünhagen, Mauthner, Donders, Ad. Weber, H. Schmidt, Leber, Brailey, von Stellwag, Cusco, E. v. Jäger, Schnabel, Sattler, Fuchs, Hancock, Fick, Knies, Michel, Langendorff, Braunstein, Dogiel, Stiel, Mulert, and others, on glaucoma, or on the sympathetic nerve, were duly considered. Fuchs on "Iriskrypten," and Greeff's "Befund am Corpus Ciliare nach Punction der vorderen Kammer," were also referred to.

As a result of irritation of the proximal end of the unilaterally severed cervical sympathetic nerve Hermann, in his "Handbuch," Vol. IV., p. 415, presents the following summing up: "In the proximal region, supplied by this cut and stimulated nerve, the arteries, the capillaries and the venous roots leading from the latter are seen to have become paler (*i. e.*, they are contracted) in contradistinction to the venous trunks which remain well filled (*i. e.*, dilated to the normal limit). Further, the very important deduction from the experiments of Schiff, Bensen, Adamük, etc., is the decided *increase* in the blood pressure," and upon this do we here immediately want to lay especial stress.

Besides controlling the constriction of the blood vessels of the orbit, the sympathetic nerve is regarded, I believe, quite generally, as governing the action of the dilator of the pupil, an action of much consequence in glaucoma. It would be absolutely wrong, to suppose, that the pupillary dilatation in a bulbus with, for example, T + 1 or + 2, be solely dependent upon sympathetic irritation, here no doubt would compression of fibers of the oculo-motorius also play a part, and this may account for the irregularity of the pupil in some cases; yet this latter condition may be simply due to the more conspicuous state of a normally, irregularly round or oval pupil when it is dilated.

The foundation of this theory is then an irritation of the sympathetic nerve, but the exact cause of the latter can not be presented until this nerve has been histologically studied, par-

ticularly in its relation to glaucoma. Some might propose as the cause of glaucoma the digestive system, others the nervous, and still others the circulatory system, but it is more advisable to reserve these opinions until the macroscopical and microscopical examinations from this standpoint have been completed, at least for a number of years. Subjects of glaucoma are daily dying, thus material for such examinations will not be wanting.

If we regard such an irritation of the sympathetic as existing in fact, must not necessarily a transudation result from the blood vessels, whose contents are subjected to an increased pressure, which, as well as the caliber of these vessels, varies directly with the character of the irritation?

The cases of unilateral sympathetic paresis or even paralysis are by no means rare, but an ophthalmological difference in the caliber of the blood vessels of the fundi is not laid down in a single record. From this we see that the paralysis of the sympathetic nerve, although it is the vaso-constrictor, does not influence the size of the blood vessels of the fundus. Then, for example, given an unilateral sympathetic irritation, can we, from the foregoing, expect constriction of the blood vessels of the fundus?

It is further quite probable, that the stronger the irritation the greater are the destructive characteristics of the transudation. Here, both the quality and quantity of such transudations concern us. Those portions of the bulbus must transude most whose vascular supply is greatest, providing all parts are equally subjected to a given sympathetic irritation; so, here, too, will the destruction be most marked when an impairment presents itself to the exit of the excretion from the bulbus.

It will be remembered, that the choroidal blood vessels around the disc anastomose with the blood vessels supplying the optic nerve, and it is this union which plays an important rôle in the formation of the glaucomatous halo. That most of the blood coming from the choroid coat, as well as the greater part of that from the ciliary body, leaves the bulbus through the venæ vorticosæ, must not be forgotten. The position of these veins is also of moment.

The iris, when it is in a state of contraction, necessarily contains less blood. The greater the contraction, the smaller do the crypts of Fuchs become. These crypts should act as

exits for aqueous humor. Where the bulbus capsule is perforated by the optic nerve, the venæ vorticosæ, etc., it is weakest, and therefore in these places it must naturally first yield to an increased intraocular tension.

It is quite manifest, that the central artery, perforating a membrane like the lamina cribrosa, in order to enter a bulbus which is under an abnormally high tension must pulsate when it is itself subjected to a sympathetic irritation, resulting in vaso-constriction and elevated blood pressure. The central venous current, also, where it leaves the bulbus, is exposed to an obstruction at this same place and must increase the caliber of its vessels.

The curvature of the anterior surface of the lens in glaucoma is positively of paramount importance; in the acute glaucoma, when œdema of the lens exists, this is of still greater consequence than in the chronic forms.

Fuchs, in the fifth edition of his text-book, page 292, says: "Every increase or decrease of the pressure in the blood vessels of the eye must produce a corresponding change in the intraocular tension." This is not manifest under normal conditions as the exits for the fluids are sufficiently capable of compensating action, but let these changes be associated with certain pathological conditions and the fact will be sooner or later disclosed.

All changes seen in glaucoma in the blood vessel walls, which could possibly aid in the production of this disease, are probably as a rule only secondary ones and brought about by the primary cause—the sympathetic irritation and its train of symptoms.

In inflammatory glaucoma (acute or chronic) the contents of the anterior chamber have been found to be more coagulable and richer in albumen than in the normal eye; whether these characteristics be possessed by the aqueous humor in the chronic, simple form, has not as yet been determined. Yet, this is to be expected, if all forms of glaucoma result from the same cause, and this is what we claim.

We allow the aqueous humor to escape by operative interference in order to assist in clearing up vitreous opacities, and often succeed in this. The fact that the anterior chamber, when punctured post-mortem, may become restored led Deutschmann to believe, that such a fluid could only come

from the vitreous chamber. We may then expect, that the exits in the disc around the central blood vessels of the retina can give passage to a like fluid, as that which escapes through the ang e of the anterior chamber, *i. e.*, the meshes of the pectinate ligament and the canal of Schlemm. Mauthner, in his valuable work on "Glaucoma," page 142, tells us that the aqueous humor is in part an unused portion of the fluid supplying the vitreous and lens with nutriment.

Whether the one or the other form of the now generally adopted classification of glaucoma results in a given time, depends, to a certain degree, upon the anatomical construction of the eye. The state of the anterior chamber, whether it is more or less shallow, seems to me to depend on the same cause, or, to be more definite, on the state of the zonule of Zinn. It is known, that in the myopic eye the zonule of Zinn is weaker, less developed, than in the hypermetropic or emmetropic eye on account of its much more limited action. Its proportions vary exactly as does the ciliary muscle in these eyes of different length and breadth. Thus in the hypermetropic and emmetropic eye its interspaces must be smaller and less permeable and consequently more easily obstructed than in the myopic eye when under the same conditions (*i. e.*, irritation). This condition of the zonule of Zinn tends to govern the depth of the anterior chamber in glaucoma and our opinion is that the zonule of Zinn is most impervious when it is relaxed. The time of a partial or complete obstruction of the angle of the anterior chamber must also come into consideration.

To explain the excavation of the papilla in an eye with normal tension, lacking a history of inflammatory attacks, we have chosen the following procedure:

It is that part of the disc which is pierced by the central vessels that concerns us mainly, because it is here that an exit must exist for lymph circulating in the vitreous space. Although this passage is not as plainly outlined as those in the periphery of the anterior chamber, there is no doubt as to its existence. In microscopically examining a bulbus of a rabbit employed in repeating the experiments of Knies (injecting ung. hydrarg. ciner. in ol. olivar. et ol. turpent. into the vitreous chamber to set up glaucoma), I chanced upon collections of mercury about the central blood vessels of the optic nerve

also within the optic sheaths and just exterior to the sclera immediately surrounding the posterior pole of the eye. Let us suppose, then, that as the outcome of the sympathetic irritation we have a fluid altered in quality and slightly increased in quantity, circulating in the vitreous space and seeking an exit through the papillary lymph orifices. This alteration may be very slight and yet it may injure the capacity of these excretory channels, in that it gradually leads to a diminution in their caliber. The central bloood vessels of the disc (and any others here) are not exempt from this sympathetic irritation, so they also aid in obstructing these channels. The transudation from the blood vessels which are in immediate contact with the lamina cribrosa as also the peculiar mode of excavating the disc, presently to be outlined, aid together in explaining those connective tissue changes which Brailey has termed characteristic of early glaucoma. The excavation is then the result of this altered fluid, following its normal course toward the center of the disc, where it is now met by an obstacle. It is this current which gradually exerts its influence principally upon the center of the disc containing such extremely delicate nervous elements. As it is exactly these fibers that supply the extreme periphery of the retina it is in this part that an early disturbance in function must occur. Through the force of this very current alone this excavation of the disc must become deeper and broader since it pushes this partial obstruction before it. Under these conditions the nutrition of the disc must become injured and its resistance become more and more lessened.

The retinal rods and cones would not at once materially suffer from this fluid which results from the sympathetic irritation. When the exits for its excretion, however, have become too defective then they may be destroyed, not only by the mere presence of the fluid, but also by the consecutive increase found accompanying an increased intraocular tension. If the anterior passages for this lymph into the anterior chamber and its exits from the latter are sufficiently wide for all demands no marked or even diagnosticable increase in intraocular pressure results. The excavation must therefore be due to an altered lymph with obstructing properties which circulates in the vitreous space and acts upon the excretory lymph channels of the disc, not only by blockading them, but also by the very

force of its stream. The destruction is certainly more rapid in comparison with this slow form, just pictured, when it is assisted by a decided increase in pressure in the vitreous chamber, as it must result, when all the exits have become insufficient, but principally those in the angle of the anterior chamber

The question might here arise, why, if the disc is excavated, are the lymph exits here not larger? This can not be, as the obstruction in these channels by the current and the following atrophy of nervous elements is slowly pressed backwards, probably as far as the exit of these spaces into apertures of similar function within the sheath of the optic nerve. Here this partial obstruction may stop, or it may undergo a connective tissue change, becoming part of the sheath of the atrophied nervehead and thus it leads to total destruction.

In the same manner in which the destruction of the nerve fibers of the disc took place must the structures which form the angle of the anterior chamber suffer, the anterior exit for this lymph, which is here termed aqueous humor. The grave changes will present themselves much earlier upon the disc than in the angle of the anterior chamber by reason of the tissue involved, nervous tissue being much more vulnerable than elastic (ligamentum pectinatum) or connective tissue. The function and construction of the part (shape and relations) must also be considered. Any tissue bathed for a lengthy period in such a fluid as we have spoken of must in time have its nutrition disturbed and its resistance diminished. The elasticity of the fibers of the ligamentum pectinatum being diminished, must not its meshes become less pervious to this altered humor aqueous and thus become insufficient to satisfy the needs?

When, during the formation of this excavation as just delineated, the *main* exits in the anterior chamber or elsewhere become too deficient, the tension begins to increase,—glaucoma simplex with elevated tension; if these exits be far too incapable of doing their duty, visible inflammation results, probably principally from stagnation of the excretion,—glaucoma inflammatorium. Should, in the course of the simple form (with or without plus tension) the irritation for any reason suddenly be increased, an acute exacerbation with apparent inflammation and well elevated tension would be the outcome, providing the excretory passages grew rapidly inadequate. So

too, should all excretory orifices in a *normal* eye become very defective in consequence of a violent sympathetic irritation, is it probable, that an acute glaucoma inflammatorium would result. Bearing in mind, that this sympathetic stimulation may differ in force, we can with facility picture to ourselves the various forms of glaucoma occurring with or without excavation of the disc.

From this hypothesis an operative interference and one most probably curative of glaucoma must be deduced. Such a procedure is easily carried out on the cervical sympathetic nerve. To simply incise that nerve (collectively) is insufficient, since we know how quickly union would again take place, but the excision of a small portion is the proper mode of action.

As said in the introduction, only the most salient points of this theory are here treated of, reserving the remainder as also the significance of many facts mentioned for a more detailed and explicit account which can soon be published should the reception of this article warrant such a proceeding.

FURTHER HISTORY OF A CASE OF SCIRRHOTIC CARCINOMA OF THE ORBITAL LACHRYMAL GLAND OF THE RIGHT EYE.

BY J. ELLIS JENNINGS, M.D., ST. LOUIS, MO.

HISTOLOGICAL EXAMINATION OF SECONDARY ORBITAL GROWTH.

BY ADOLF ALT, M.D., ST. LOUIS, MO.

THE report of this case, with microscopical examination by Dr. Alt appeared in the April, 1897 number of this Journal. The tumor was first noticed in 1885 and grew slowly without causing any pain or inconvenience other than proptosis of the eyeball. In August, 1896, the tumor began to grow more rapidly accompanied by a burning pain in the eye and severe headache and neuralgia. V., O. D.=$^{2}/_{LX}$. The tumor was excised February 4, 1897, and when the dressings were removed, one week later, the eyeball occupied its normal position in the orbit.

April 7. There was considerable proptosis which, returning at so short a time after the operation, was thought to be due to cicatricial contraction.

June 24. Was called to see the patient on account of severe headache and neuralgic pains which were steadily becoming more severe. The eye is quite prominent and disfiguring and the sight is entirely lost. The growth has evidently returned as a hard mass is felt above the eyebail. Advised evisceration of the whole contents of the right orbit, which was done June 29.

August 10. Saw patient again at her residence. She now complained that the sight of the left eye was rapidly failing. There was evidently some sight left in the eye, as the patient walked into the room and took a chair without assistance. But two days later the patient was brought to the office in a carriage and had to be led into the room. To my surprise I found no perception of light. Pupil fixed and 5 mm. in diameter. There was paralysis of the external rectus muscle. An ophthalmoscopic examination revealed nothing to account for the sudden loss of vision. Arteries and veins somewhat narrow, the disc pale and surrounded by a patch of choroidal atrophy, but the condition of the fundus was about the same as when examined February 15. On removing the bandage the right orbit is felt to be filled with a stony hard growth.

September 20. Patient failing rapidly. For several weeks she has been getting deaf and the family have to shout at her. She is confined to bed and can not stand on account of weakness in her limbs. There is incontinence of urine, and the patient is gradually passing into a state of stupor. Patient died on October 18, 1897.

Microscopical Examination.

The secondary tumor which, together with the eyeball (unfortunately hardened in alcohol), I obtained through the kindness of Dr. N. B. Carson, of this city, consisted of a number of pieces of different sizes.

While in the original tumor the epithelial cell tubes were widely separated by a large quantity of connective tissue, these tubes lie very closely packed in the secondary tumor.

In fact the connective tissue bands ars just barely visible. (See Fig. 1).

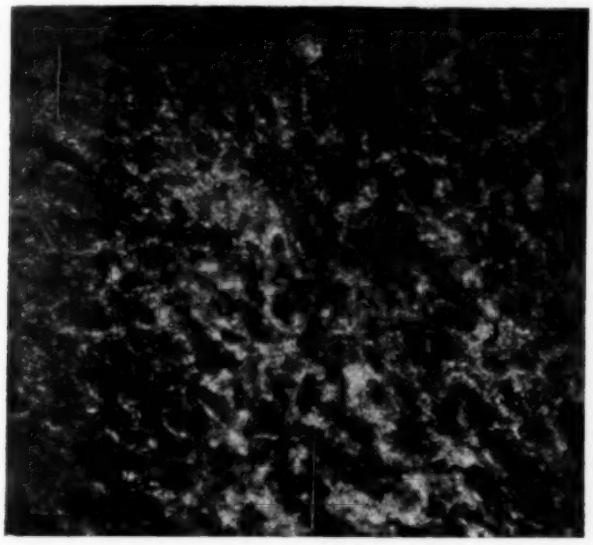

FIG. 1.

In a number of sections the epithelial tubes are so closely packed and arranged in such a way that the picture closely resembles a malignant adenoma. The cells themselves show no retrogressive change, but on the contrary, cells with two nuclei are frequent and karyokinetic figures are not wanting.

We have here then again a case of orbital tumor which, though malignant in its character, grew for twelve years without producing anything more than, if I may say so, a local inconvenience. No sooner, however, was this primary growth removed and, apparently, in a thorough manner, when the tumor elements which must have remained behind, as if enjoying their freedom, spread rapidly and invaded the surrounding orbital tissue and the cerebral cavity. Inthis manner death resulted within five months from the primary operation and was preceded by a great amount of suffering.

Such cases, it seems to me, should prompt us under similar circumstances, to empty the orbit of its whole contents and thus, perhaps, save the life of the patient, rather than to save

the eye and—as it is evident in such cases—have the patient die as the result of our surgical interference.

This is, of course, not a new observation, yet, I think, it deserves to be dwelled upon.

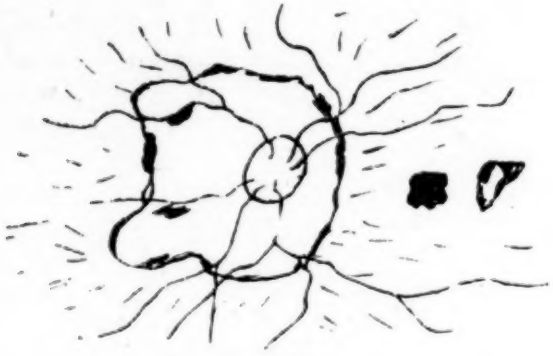

FIG. 2.

The eyeball, being very badly shrunken by the alcohol, did not yield as nice microscopical specimens as I had hoped it would. Yet, aside from the changes at the posterior pole, accompanying a high degree of myopia I found a number of choroido-retinal atrophic patches corresponding to the changes seen in the fundus ophthalmoscopically by Dr. Jenninge. (See Fig. 2).

NOTE ON PROTARGOL IN OPHTHALMIC PRACTICE.

BY ADOLF ALT, M.D., ST. LOUIS, MO.

SOME two months ago I received the first number of a new journal on "Dermatology," published by Dr. Max Joseph, in Berlin, which contains an article by A. Neisser (of gono-coccus fame), entitled, "The Treatment of Acute Gonorhœa. A New Silver-Salt, Protargol, etc."

The results which Neisser had reached by using this new silver-salt in treating inflammation of the urethral mucous membrane and particluarly the statement, that it produces almost no irritation while being as effective and more so than

silver-nitrate on account of its penetration into the depth of the tissues, prompted me to give protargol a trial in the treatment of all forms of conjunctival inflammation in which I had thus far applied silver-nitrate.

While I am now, after a two months trial, not trying to praise protargol as a panacea for all conjunctival inflammations, I am so impressed and pleased with its beneficial and almost painless action on the conjunctiva, that I want to draw the attention of my confrères to this new silver-salt, protargol, as early as possible.

As far as my experience goes, it acts as well as silver-nitrate, sometimes, indeed, in cases of acute conjunctivitis, I am satisfied it acted quicker, than the older favorite.

I have used it thus far only in a 1 per cent. solution. In this strength it causes no noticable inconvenience to the patients who, on that account, greatly prefer it to the silver-nitrate.

It would be tiresome to relate individual cases here, it may suffice to repeat, that wherever silver-nitrate is indicated, it is well to give protargol a trial instead, and I have no doubt that in a great many cases, if not in all, the results will be gratifying.

The following information I translate from Neisser's article:

"The new silver-salt, protargol, is prepared by Fr. Bayer & Co., in Elberfeld, Germany.

"Protargol contains 8.3 per cent. of silver (Arg. nitr., 6.35 per cent.; Argonin, 4.2 per cent.; Argentamin, 10 per cent.). It is a chemical combination of silver with a proteine substance, and forms a yellowish fine powder which can be solved easily in cold or hot water by shaking. (Hot water is better—Alt). Heating to a high degree does not render the solution dim.

"Its most important peculiarity, not shared by any other silver-salt, is that from the aqueous solution it is not precipitated by either albumen, diluted chlorate of sodium, diluted muriatic acid, or caustic soda. Ammonium sulfate gives it a darker color, but causes no precipitate. Concentrated muriatic acid produces a precipitate, yet what is precipitated is not silver chloride, but protargol, which, when more water is added, is re-dissolved.

"These characteristics give this salt as great a faculty

of an unlimited penetrating action on the tissues as no other silver-salt enjoys. It is superior to argentamin which, otherwise, is the best silver-salt, in that in solutions of one-fourth, one-half, and one per cent., it causes but an extremely small amount of irritation.

"The experiments concerning the bactericidal action of protargol are as yet unfinished. * * *

* * * "Its action on the mucous membrane may be prolonged without a weakening of its concentration or a diminution of its action on the deep tissues being produced by any chemical changes."

ADDITIONAL PAMPHLETS RECEIVED.

"Treatment of the Infectious Diseases of the Eye by Subconjunctival Injections of Sublimate," by Jehin Prume, M.D.

"Is There Ever a Serous Iritis Without an Involvement of the Ciliary Body or Choroid, or both?" W. Cheatham, M.D.

"Bacteria in the Normal Conjunctiva, Etc. The Staphylococcus Epidermidis Albus, Etc.," by R. L. Randolph, M.D.

"Demonstration of an Easy and Certain Process of Producing Monocular Diplopia by Means of a Prism, Etc." by S. Baudey, M.D.

"Cataract and Its Association with the Gouty and Rheumatic Diathesis, and Their Relation to Diseases of the Eye," by S. D. Risley, M.D.

"A Clinical Study of a Case of Double Chorio-Retinitis in the Macular Region, Following a Flash of Lightning and a Flash from Burning Lycopodium," by Ch. A. Oliver, M.D.

SOCIETY PROCEEDINGS.

OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

H. R. SWANZY, M.B., F.R C.S.I., President, in the Chair.

THURSDAY, OCTOBER 21, 1897.

Some Experiments on the Union of Corneal Wounds.—MR. ERNEST CLARKE related experiments consisting of various operations on the cornea of rabbits whereby the anterior chamber was completely emptied of aqueous with the view of ascertaining the time taken by these wounds in uniting sufficiently to allow the anterior chamber to be reformed. Description of the methods adopted in operating and preserving the specimens were given. Two classes of experiments were performed. In the first class the animal was kept under an anæsthetic and killed. The anterior chamber was found to be present in two minutes, and fully re-formed in twenty-five minutes. In the second class the animal was allowed to recover, and, after varying intervals, ranging from half an hour to two hours and a half, again placed under an anæsthetic and killed. The movements of the animal caused delay in the reformation of the anterior chamber. The average time was an hour and a half. Wounds at the upper margin united most rapidly with less scar. Wounds across the center of the cornea and at the lower margin took longer to repair and made a larger scar. The rapidity with which the anterior chamber was re-formed suggested that if, during an operation on the eye where the presence of the aqueous was necessary, this aqueous were accidentally lost, the eye should be bandaged, and the continuance of the operation postponed only for half an hour at the outside instead of postponing it until the next day, as was generally done. The experiments also showed the great influence that rest had on the process of repair, and emphasized the importance of keeping patients absolutely quiet for the first few hours after an eye operation.

THE PRESIDENT thought that the value of these interesting

experiments would have been increased if it could have been determined how soon a wound in the cornea which had closed became impervious to the entrance of infective organisms.

Remarks were made by MESSRS. BATTEN, ARGYLL ROBERTSON, and MARSHALL; and MR. E. CLARKE replied.

Dislocation of Lens; Couching; Recovery.—MR. T. H. BICKERTON related a case of congenitally misplaced lenses. The patient was a male, aged 28 years. He had been short-sighted since infancy; at 14 years of age he had attacks of giddiness, which caused him to fall and injure his forehead. At the age of 19 he began wearing glasses: R.—6.5 D., L.—6 D. He was first seen in December, 1887. At that time the iris was tremulous; the lens was dislocated into the vitreous in each eye: V. R.c. + 10 D.=$^{6}/_{XI}$; L.c. + 10 D.=$^{6}/_{XXIV}$. On reading the refraction was entirely different: J. 1 at $3^{1}/_{2}$—4 in.; he looked through the displaced lens. In 1893 he suddenly went blind in the left eye, but the vision was restored next morning. He had two more attacks of the same nature after; during the last one eserine was used, and the eye did not recover as it had previously done. When seen after this occurrence in December, 1893, there was pain and congestion, and the clear lens nearly filled the anterior chamber The unsatisfactory results obtained from extracting such lenses, and the knowledge that these lenses had been tolerated so long in the vitreous suggested to the author the alternative of reposition. On December 30, 1893, this was done; the pupil was dilated, an incision at the margin of the cornea was made with a keratome to evacuate the aqueous, it was attempted to press the lens back through the pupil by the finger applied to the closed lid; this could not be done, and a spatula was introduced into the anterior chamber; the lens then slipped back into the vitreous. Perfect recovery followed, and in June, 1897, three years after, the vision of the eyes was

$$\text{R.c. + 12 D. } {}^{6}/_{5} \text{ ptly, } \frac{\text{L.c. + 12 Ds.}}{\text{— .75 D. cyl.}} = {}^{6}/_{V}.$$

The interest of the case lay in the fact that blindness followed the use of eserine, which prevented the lens from passing back again into the vitreous, and the fact that the eyes had remained perfectly healthy, although the lenses had been dislocated into the vitreous nearly four years.

Card Specimens.—The following were the card specimens:

Mr. Adams Frost, "Odell and Porter's Centering Instrument for Ophthalmic Lenses."

Mr. Arnold Lawson, "Leuco-Sarcoma of the Choroid."

Dr. Rayner Batten, (1) "Foreign Body Found Impacted on Optic Disc After Removal of Traumatic Cataract"; (2) "Pulsating Tumor of Orbit, (? Meningocele)."

Dr. J. F. Buller, "Case of Deficiency of the Choroid."

Mr. Lang, "Primary Syphilitic Lesion of Inner Canthus."

G. A. Berry, F.R.C.S.Edin., Vice-President, in the Chair.

Thursday, November 11, 1897.

Heredity and the Development of Myopia.—Mr. Wray began by stating that some observers found a family history in as many as 60 per cent. of their cases of myopia. On the assumption that one-fourth of the hereditary tendencies were from each parent, and one-sixteenth from each grandparent, it was plain that hereditary predisposition would appear more and more in the etiology of myopia. Mr. Wray questioned the expediency of using the term "acquired myopia" lightly as no case could legitimately be called acquired unless ancestral myopia could be disproved, which the author contended was impossible. He next submitted that authorities repudiated the possibility of the transmission of acquired structural peculiarities, and experimental evidence was quoted to the effect that the removal of an eye in rabbits during many successive generations failed to cause the birth of one-eyed offspring. The author conceded the transmissibility of ordinary myopia, and then stated that there was no relation between the sum of the myopia of myopic parents and the amount that would appear in the offspring, and when the highest grades had been found the parental myopia was invariably confined to one parent. Since Fukala's operation had come into vogue, the author had given special care to the investigation of the antecedents of such patients, and found in a considerable number of cases that the child with very high myopia has suffered from protracted infantile marasmus, whilst the brothers and sisters who escaped had not. He further stated that out of 126 cases of myopia over 10 D., he had not found one instance

in which parent and child were both subject to an equal or approximately equal amount. The existence of the highest grade of myopia in one eye only made it exceedingly probable that other influences acted as powerfully as marasmus in the predisposed. Since such grave disproportions never arose in the limbs during their development, it was necessary to consider the difference in their development, and this was to be found in the way in which the vitreous was formed by the passage of mesoblastic elements into the secondary optic vesicle. Mr. Wray suggested the possibility of hypoinclusion being the basis of hypermetropia and excessive inclusion the cause of myopia. He alleged that this theory would explain the variation in the age at which myopia appeared, and the phenomena of stationary and progressive hypermetropia and myopia, as well as numerous other points in the pathology of myopia.

Potassium Permanganate in Ophthalmia. — Mr. Sydney Stephenson communicated particulars of a case of purulent ophthalmia in a baby, where the frequent use of a strong solution of potassium permanganate had given rise to a deposition of manganese dioxide upon the cornea. The mark, which was of coal-black color, disappeared a few days after the use of the solution had been discontinued.

Cataract Extraction.—Surgeon-Captain Herbert, I.M.S., said that the conditions of operating were unfavorable in India, and he had found it impossible to exclude infection till he employed strong perchloride (1 in 2,300) as a routine antiseptic. The lotion was used freely to the face, lids, and conjunctiva, then cocaine was instilled, the lids being kept closed to prevent the drying of the epithelium, and during the operation the surface of the eyeball was kept moist by the constant dropping of boiled saline solution. Since the adoption of this method he had performed 281 extractions; there had been no suppurations, and no iritis severe enough to affect vision.

A discussion on the value of asepsis as opposed to antisepsis followed in which Messrs. Berry, Nettleship, Hill, Griffith, Lawford, and Cargill took part.

Pseudoglioma Due to Choroido-Retinitis Secondary to Men-

ingitis.—MR. L. V. CARGILL described the case of a male infant, with good family history and born at full term, who was perfectly healthy until 3 months old, when it suddenly developed meningitis. A fortnight later the left eye was noticed to be affected with pseudoglioma. Two months afterwards hydrocephalus was developing, and was associated with retraction of the head. Right optic papillitis was discovered, whilst the left membrana tympani was found perforated, there having previously been slight purulent discharges from the left ear. The hydrocephalus increased, the left eye underwent shrinking, whilst the right eye remained unaffected except for atrophy of the optic disc. The child died about ten months after the first onset of illness. A post-mortem examination was not obtained.

MR. TREACHER COLLINS had observed from pathological examination that these cases were more often retinitis than uveitis. The course of the affection was from the throat by the Eustachean tube, middle ear, meninges, and optic nerve to the eye.

Case of Albuminuric Retinitis.—This paper was read by DR. ARNOLD LAWSON and DR. SUTHERLAND. F. B., aged 12 years, was brought to the hospital on October 29, suffering from headache and vomiting. Examination showed the presence of albumen in the urine and albuminuric retinitis in both eyes. The history of her illness consisted of intermittent attacks of headache during the last ten months. These had hardly become much worse, and were frequently accompanied by vomiting and great prostration. The past history was excellent. She had never had scarlet fever or any cardiac affection. She was always a ravenous eater, and especially fond of meat. The family history was good except for phthisis on the mother's side. The patient was bright and intelligent, and showed no lethargy. There was a diffused heaving impulse over the precordial region. The apex beat was three-quarters of an inch outside the nipple line in the fifth space. The heart's first sound at the apex was rough, and accompanied by a short blowing murmur. The second sound accentuated at the base; the sounds were clear and ringing, the second being accentuated. Arterial pulsation was visible in the large vessels of the neck. The pulse was small, regular, and of high tension,

and there appeared to be some thickening of the vessels walls. The urine was acid, specific gravity 1010, cloudy. Albumen was present in considerable quantities. Microscopically casts, for the most part hyaline, but also a few epithelial or fatty, were found. The fundus in each eye presented the usual changes due to albuminuric retinitis in a typical and advanced form. The case appeared to be one of primary chronic interstitial nephritis occurring at an unusually early age. The symptoms were precisely similar to those met with in adults suffering from this disease. The cause was obscure. Possibly a long course of over-feeding might have so affected the blood as to induce irritative changes in the kidney. No record of any case of albuminuric retinitis occurring at so early an age could be found. One case at 15 years had been recorded by Mr. Benson in 1883. The prognosis as regards duration of life, though very bad, could probably be modified by efficient treatment, and placing the child in the most favorable circumstances as regards home comforts and nursing, etc.

MR. NETTLESHIP called to mind two cases of albuminuric retinitis in children. One was in a boy, the details of whose case he could not recall, but who was under observation for a year; the other was in a little girl, who was said to have recently had Bright's disease. In the latter case there was great pallor of the optic nerve, and old retinal changes with much impairment of vision.

DR. BREWER said that Dr. Bull had published a series of cases, one of which was in a boy aged 5 years. In every case in which a post-mortem examination had been made interstitial and not glomerular nephritis had been found.

MR. LAWFORD had recently seen a boy, aged 17 years, with albuminuric retinitis; he also had chronic interstitial nephritis; he improved materially.

MR. HOLMES SPICER had recently been asked to see a child at the Children's Hospital who had all the signs of acute nephritis; on examining the eyes there were a few small retinal hæmorrhages, but no large masses of exudation.

BOOKS AND PAMPHLETS.

OPTIQUE PHYSIOLOGIQUE (PHYSIOLOGICAL OPTICS). By Dr. Tscherning. Paris: G. Carré and C. Naud.

This is a most excellent treatise. It is written in a simple and clear style which renders it very perspicuous. Perhaps the most interesting chapter in it is the one on "Accommodation." In this Tscherning gives in detail his explanation of this function which, as our readers well know, differs essentially from those of Helmholtz, Young and others. It vouchsafes to the longitudinal fibers of the ciliary muscle that amount of influence on the act of accommodation which, from their histological importance, one should naturally expect. The illustrations are manifold and to the point. The print is most beautiful.

We hope that an English edition of this work will at an early date be offered to the English-speaking ophthalmological public.

PAMPHLETS.

"Glaucoma," by Schulek Velmos.

"Congenital Ptosis," by M. F. Coomes, M.D.

"Tumors of the Orbit," by W. Cheatham, M.D.

"Ophthalmia Neonatorum," by L. W. Fox, M.D.

"Ulcers of the Cornea, Etc.," by L. W. Fox, M.D.

"Ichthyol in Ophthalmology," by A. Darier, M.D.

"The Etiology of Strabismus," by E. Landolt, M.D.

"The Visual Effects of Refractive Error," G. J. Bull, M.D.

"Statistics of 2641 Cases of Trachoma," by Y. Onisi, M.D.

"The New Local Anæsthetic, Holocain," H. Derby, M.D.

"Should Opticians Practice Medicine?" by A. A. Hubbell, M.D.

"Seventeenth Annual Report of the Newark Eye and Ear Infirmary."

"The Relation of Eczema to the Mucous Membranes," by Dr. von Schlen.

"Sozoiodol in the Treatment of Eye Diseases," by B. Byélilowsky, M.D.

"The Treatment of Complicated Ulcers of the Cornea," by C. A. Veasey, M.D.

"A New Method of Mounting Ophthalmic Specimens," by Priestley Smith, M.D.

"Seventh Report of the Eye, Ear, Nose and Throat Hospital of New Orleans, La."

"First Annual Report of the Texas Eye, Ear and Throat Charity Hospital." Austin.

"Refraction of the Eyes of 1,000 School Children, Etc.," by W. M. D'A. Carhart, M.D.

"The Desirability of a Periscopic Quality in Correcting Lenses," by C. M. Culver, M.D.

"Further Experiences with Chronic Diplo-Bacillus Conjunctivitis," by Th. Axenfeld, M.D.

"The Early History of Ophthalmology and Otology in Baltimore," by H. Friedenwald, M.D.

"Gout and Rheumatism as Factors in the Etiology of Glaucoma," by Ch. O. Richey, M.D.

"Intraocular Hæmorrhage During or Shortly After Cataract Extraction," by E. E. Jack, M.D.

"Hysterical Monocular Amblyopia Coexisting with Normal Binocular Vision," by M. Prince, M.D.

"On the Value of the Refraction of the Cornea and Lens of the Newly-Born," by Th. Axenfeld, M.D.

"Lesions of the Retinal Vessels, Retina and Optic Nerve, Associated with Gout," by Ch. S. Bull, M.D.

"Report of the Work of the Ophthalmological Circle of Moscow from 1887 to 1897," by Prof. Krukow.

"Description of a Successful Operation for Blepoaroplasty, Etc., for Epithelioma," by Ch. A. Oliver, M.D.

"Note on the Use and Non-Use of the Occlusive Bandage in Cases of Heterophoria," by F. W. Marlow, M.D.

"A Plea for the General Use of Measures to Prevent Ophthalmia Neonatorum," by A. A. Hubbell, M.D.

"Primary Sarcoma of the Lachrymal Caruncle, With the Report of an Additional Case," by C. A. Veasy, M.D.

"A Brief Study of the Ophthalmic Conditions in a Case of Cerebellar Tumor; Autopsy," by Ch. A. Oliver, M.D.